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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/715,935	11/17/2000	Xiangxin Bi	2950.16US02	9146

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EXAMINER	
FULLER, ERIC B	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No. 09/715,935	Applicant(s) BI ET AL.	
	Examiner Eric B Fuller	Art Unit 1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 March 2003 .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 18-61 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 18-61 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Request for Continued Examination

The Request filed on March 28, 2003 for Continued Examination (RCE) under 37 CFR 1.114 based on parent Application No. 09/715,935 is acceptable and an RCE has been established. An action on the RCE follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 55-58 and 60 are rejected under 35 U.S.C. 102(b) as being anticipated by Kambe et al. (WO 99/23189).

Kambe teaches reacting a stream to produce a product stream comprising particles produced by the reaction (page 8, last paragraph; figure 2). The collection chamber that collects the particles on a filter reads on depositing the particles on a substrate. The disclosed flow rates read on the applicant's claimed flow rates (page 14, lines 10-15). A silicon precursor may be used (page 21, lines 5-10). A laser drives the reaction (page 11, lines 16-30). The reaction stream has a major axis that is at least a factor of two greater than the minor axis when it is passed through the rectangular slit (page 10, lines 15-20; fig 1, ref 206; fig 2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18-29, 33-42, 44, 46-51, 55-57, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Akedo et al. teaches a film forming apparatus that directs a particle stream, which is made up of nanoparticles, towards a substrate and moves the substrate relative to the particle stream in order to coat the substrate (column 3, line 10-12). The input of this apparatus is a continuous stream of particles with a size ranging between 10 nanometers to 5 microns (column 2, lines 41-60). Akedo fails to teach how the particles are produced. However, Bi teaches an apparatus that reacts a reactant stream by directing a focused radiation beam at the reactant stream to produce a product stream comprising particles downstream from the radiation beam, wherein the reaction is driven by energy from the radiation beam (summary). The product stream of this apparatus is a continuous stream of nanoparticles. The benefit over the prior art in using this method in order to produce nanosized particles is the efficient use of resources at high production capacity without sacrificing particle quality (column 2, lines

16-24). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have the Bi apparatus provide the nanoparticle input of the Akedo apparatus (reference 23, figures 6 and 9). The references fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Claim 30, 43, 45, 52, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lehman (US 6,097,144) in view of Akedo et al. (US 6,280,802 B1), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134) in further view of Kambe et al. (WO 99/23189).

Lehman teaches a process of producing a glass coating that involves applying frit to a cold or heated substrate. The process is performed by mixing the frit, having a

200-325 mesh size, with a carrier solvent and the spraying the coating to the surface (column 5, lines 50-67). If the substrate is cold, a series of heating and cooling steps are performed in order to melt, fuse, and anneal the glass coating (column 6, lines 1-20). Lehman fails to use the method of applicant's claim 18 to apply the glass coating. However, Bi teaches that nanoparticles exhibit exploitable chemical and mechanical properties that are different from larger sized particles (background), and that the taught apparatus is advantageous to use in order to produce these nanoparticles due to its efficient use of resources (column 2, lines 17-25). An additional obvious benefit of having the particles be of a smaller size would be the ability to form thinner, or more uniform, films of glass. The Akedo, Bi, and Rao references can be combined as taught previously in order to produce coatings by nanoparticles, and therefore it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Akedo, Bi, and Rao in order to apply the glass coating of the Lehman process in order to reap the benefits of a thinner, or more uniform, coating. Additionally, the combined process would be more efficient as a carrier solvent would no longer be required. The Kambe reference is used in order to establish that the combined Bi and Akedo apparatus is capable of producing glass particles. Kambe teaches a similar apparatus as Bi, as nanoparticles are produced by laser irradiation. The differences between Kambe and Bi are in the process that the particles perform after they are produced, and not in how they are produced. The nanoparticles produced in the Kambe apparatus is silica (abstract), which can be used for producing glass. It would have been obvious from the Kambe reference that the apparatus taught by Bi

would also be able to produce silica nanoparticles. Furthermore, it would have been obvious that the combined Akedo and Bi apparatus is able to produce silica coatings as well, as column 5, first paragraph of the Akedo reference teaches that the apparatus taught is capable of producing oxide films.

In performing this process, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use a silicon precursor in order to achieve silicon oxide as the product stream.

Claims 18-29, 33-52, and 55-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Kambe et al. (WO 99/23189) and Rao et al. (US 5,874,134).

Akedo teaches the limitations as shown above, specifically to deposit nanoparticles of oxides onto a substrate, but fails to teach using the process of Kambe as the input of the method. However, Kambe teaches the production of silicon oxide particles by a process shown above. To use the process of Kambe to provide the input of Akedo would have been obvious as the process of Kambe provide a high level of purity (page 1, lines 30-35) and efficiency (page 2, lines 1-5). The combined references fail to teach performing the process in-line.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus.

Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Kambe in an in-line fashion (having the product stream of Kambe be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lehman (US 6,097,144) in view of Akedo et al. (US 6,280,802 B1), Kambe et al. (WO 99/23189), and Rao et al. (US 5,874,134).

Lehman teaches a process of producing a glass coating that involves applying frit to a cold or heated substrate. The process is performed by mixing the frit, having a 200-325 mesh size, with a carrier solvent and the spraying the coating to the surface (column 5, lines 50-67). If the substrate is cold, a series of heating and cooling steps are performed in order to melt, fuse, and anneal the glass coating (column 6, lines 1-20). Lehman fails to use the method of applicant's claim 18 to apply the glass coating. However, the Akedo, Kambe, and Rao references can be combined as taught previously in order to produce coatings by nanoparticles. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Akedo, Kambe, and Rao in order to apply the glass coating of the Lehman process in order to reap the benefits of a thinner, or more uniform, coating that

is possible with smaller diameter particles. Additionally, the combined process would be more efficient as a carrier solvent would no longer be required.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 6,074,888) in view of Lehman (US 6,097,144), and further in view of Akedo et al. (US 6,280,802 B1), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134), in view of Kambe et al. (WO 99/23189).

Tran teaches that in order to produce an optical component, it is required to produce an optical component layer (abstract, summary), which is typically glass. Then photolithography is used to fabricate the optical component (column 3, line 59). Tran fails to teach applying the coating by the method taught by applicant's claim 18. However, it has been shown that the Lehman, Akedo, Bi, Rao, and Kambe references can all be combined to teach a method of producing a glass coating that has the advantages of being more uniform, is capable of being thinner, and does not require a solvent. To use this method of forming a glass coating when producing the optical layer taught in the Tran reference would have been obvious at the time the invention was made to a person having ordinary skill in the art in order to reap the benefits of a thinner, more uniform, coatings without the need for a solvent.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 6,074,888) in view of Lehman (US 6,097,144), and further in view

of Akedo et al. (US 6,280,802 B1), Kambe et al. (WO 99/23189), and Rao et al. (US 5,874,134).

Tran teaches that in order to produce an optical component, it is required to produce an optical component layer (abstract, summary), which is typically glass. Then photolithography is used to fabricate the optical component (column 3, line 59). Tran fails to teach applying the coating by the method taught by applicant's claim 18. However, it has been shown that the Lehman, Akedo, Kambe, and Rao references can all be combined to teach a method of producing a glass coating that has the advantages of being more uniform, is capable of being thinner, and does not require a solvent. To use this method of forming a glass coating when producing the optical layer taught in the Tran reference would have been obvious at the time the invention was made to a person having ordinary skill in the art in order to reap the benefits of a thinner, more uniform, coatings without the need for a solvent.

Claims 18-29, 33-42, 47-51, 53-57, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Börner et al. (US 6,032,871) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Börner teaches a process of spraying two different materials to a substrate by applying differing charges to each particle stream (figure 3). Börner is silent to how these particle streams are produced. However, Bi teaches that nanoparticles exhibit exploitable chemical and mechanical properties that are different from larger sized particles, such as increased smoothness and thinner coatings (background). The

apparatus taught by Bi is advantageous to use in order to produce these nanoparticles due to its efficient use of resources (column 2, lines 17-25). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the apparatus of Bi to produce the particle streams of Börner. By doing so, one would reap the benefits of having an efficient way of producing nano-sized particles such that a smoother and/or thinner coating is achieved. The references fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Börner in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Börner reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Claims 42-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Börner et al. (US 6,032,871) in view of Akedo et al (US 6,280,802), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134).

Börner teaches the desire to have powder coatings of two different materials applied to the same substrate by means of two differently charged particle streams. Akedo, Bi, and Rao, combined, teach a materially efficient method of producing charged particle streams that have the benefit of being nano-sized, which results in thinner and/or smoother coatings, as explained above. Therefore, it would have been obvious to use the method and apparatus of Akedo, Bi, and Rao to provide the particle streams of Börner. By doing so, one would reap the benefits of an efficient way to produce smoother and/or thinner coatings. By figure 3 of Börner, one in the art would be motivated, when combing the references, to have a separate "Akedo and Bi" apparatus provide each stream. This is because the streams of figure 3 are coming from separate sources.

Claims 18-20, 23, 25, 27-29, 39-41, 55, 56, and 58-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao et al. (US 5,874,134) in view of Bernecki et al. (US 5,744,777).

Rao teaches producing particles of silicon (column 6, lines 4-5) by reacting a reaction stream with a high-energy laser (column 4, lines 25-30). The particles are deposited on a substreate in-line by a hypersonic plasma particle deposition process (column 5, lines 55-60). The deposition rates are within the applicant's ranges (column 7, lines 55-65). The reference fails to teach supplying motion between the substrate and the product stream. However, Bernecki teaches that larger substrates may be coated by providing motion between the plasma spray and the substrate (column 8,

lines 25-35). Therefore, it would have been obvious to provide motion between the product stream of Rao and the substrate. By doing so, larger substrates may be coated.

As to methods of providing motion, to use a movable stage to move the substrate or means to move the apparatus of Rao would be obvious variations of each other, as both act to achieve the same relative motion.

Response to Remarks

Applicant has remarked on how the amendment acts to overcome the prior art made of record. These remarks have been considered, but are moot in view of the new grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (703) 308-6544. The examiner can normally be reached on Mondays through Thursdays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck, can be reached at (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

EBF
June 1, 2003

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